

## FISHES OF THE NEARSHORE ZONE OF ST. ANDREW BAY, FLORIDA, AND ADJACENT COAST<sup>1</sup>

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**ABSTRACT:** The catch of fish by beach seine at 17 stations in the nearshore zone of St. Andrew Bay and adjacent coast during 1974 and 1975 was studied. A total of 99,579 individuals representing 88 species and 41 families was collected. The bay system and adjacent coast were divided into four areas based upon salinity, turbidity, amount of attached vegetation, and bottom type. The central bay (Area I) had the largest catches by weight (211.3 kg), number of individuals (52,322), standing crop (37.5 kg/ha) and species (61). This area was dominated by four species (*Menidia beryllina*, *Lagodon rhomboides*, *Eucinostomus argenteus* and *Leiostomus xanthurus*), which made up 94.5% of the total catch. The upper bays (Area II) had the second highest catches (34,665), second highest standing crop (23.4 kg/ha), second highest catches by weight (115.5 kg), and second highest number of species (52). Five species (*M. beryllina*, *Fundulus similis*, *L. xanthurus*, *Lucania parva*, and *Cyprinodon variegatus*) comprised 75.7% of the collections from this area. Upper North Bay (Area III) had lower catches (3,002), lower catches by weight (17.4 kg), and lower standing crop (17.6 kg/ha) than Area II. Area III had the least number of species (25) and the area was dominated by three species (*E. argenteus*, *M. beryllina*, and *F. similis*), which accounted for 76.2% of the total catch for this area. The gulf beach stations (Area IV) had the lowest catches (1,918), second lowest catches by weight (37 kg), and lowest standing crop (7.5 kg/ha). A total of 44 species was reported from this area. Area IV was dominated by one species (*Harengula jaguana*), which made up 66.1% of the total from these stations.

Estuaries and their adjacent coasts constitute important areas of our coastal zone (Odum, 1971; Wiley *et al.*, 1972). The nearshore zone in many areas supports dense growths of seagrasses and algae (McNulty *et al.*, 1972). Many species of valuable commercial and recreational fishes inhabit these areas and use them as nurseries during parts of their life cycles (Sykes and Finucane, 1966).

The nearshore zone is also an area where physical and chemical alterations often occur. Life in this zone is especially vulnerable to damage by storms and hurricanes, upland runoff, temperature extremes, pollution, and coastal con-

struction (Bechtel and Copeland, 1970; Gunter, 1941; Ingle, 1952; Livingston, 1975; Robins, 1957; Taylor and Saloman, 1968). Beach restoration and construction of port facilities, such as those proposed for Panama City, FL (U. S. Congress, 1972) could affect the organisms inhabiting the nearshore zone (Livingston *et al.*, 1972; May, 1973; Taylor and Saloman, 1968). The purpose of our study was to determine the community composition and abundance of the fishes inhabiting the nearshore zone of St. Andrew Bay and adjacent coast in order to help evaluate the impact of these alterations.

The information gathered from this beach-seine survey will also supplement the previous work done on the ichthyofauna of St. Andrew Bay, and adjacent coast (Crittenden, 1957; Allison, 1961;

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Vick, 1964; Hastings, 1972; May, *et al.*, 1976; Brusher and Ogren, 1976; Nakamura, 1976; Trent and Pristas, 1977; Pristas and Trent, 1977).

### STUDY AREA

The St. Andrew Bay system is located in the northeastern Gulf of Mexico along the northwest Florida coast (Fig. 1). The system consists of four bays differing in size, degree of vegetation, salinity, turbidity, and water depth (Ichiye and Jones, 1961; Hopkins, 1966; McNulty *et al.*, 1972). Major sources of both domestic and industrial pollution have been identified in the system (Environmental Protection Agency, 1975;

McNulty *et al.*, 1972). East, West, and North Bays are designated Class II (waters suitable for shellfish harvesting and propagation of marine life), Deer Point Lake is designated Class I (potable water source), and the majority of St. Andrew Bay and adjacent coastal waters are designated Class III (waters suitable for fish and wildlife propagation - water contact sports) by the State of Florida (Florida Coastal Coordinating Council, 1972).

Area I (St. Andrew Bay) is centrally located and is characterized by high salinity, dense vegetation, and firm sandy bottom. Along its shoreline, a strip of bare sand extends 1 to 3 m offshore. In the shallower zones beyond the

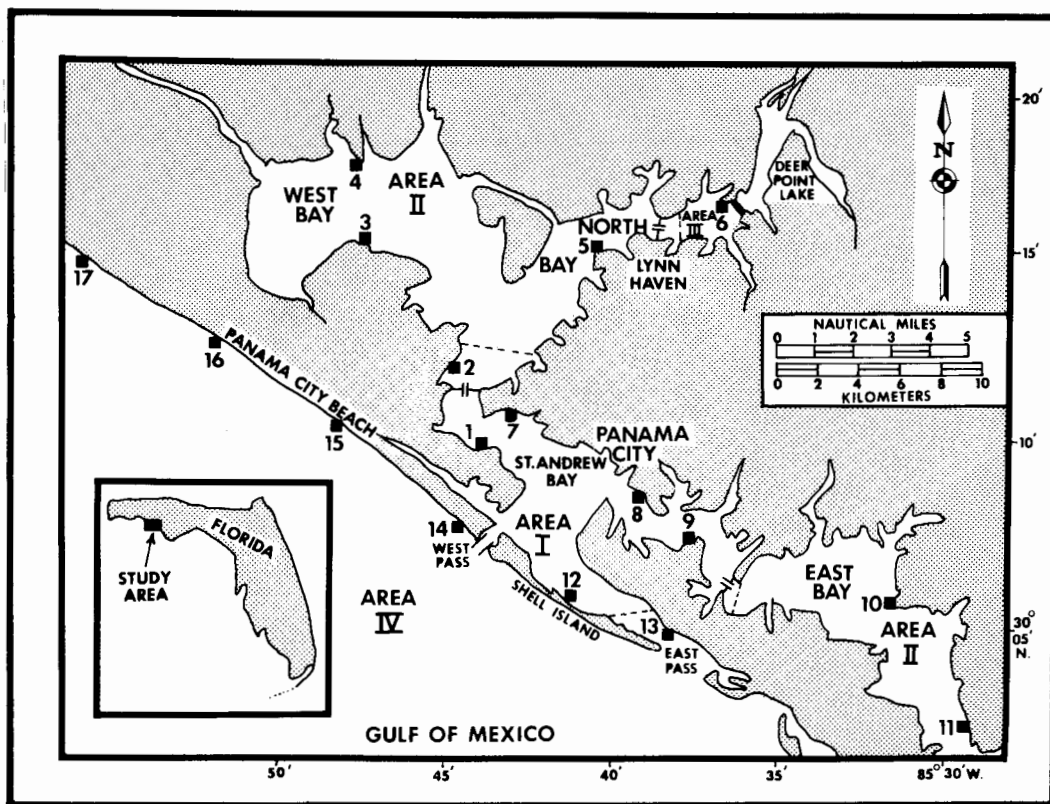


Figure 1. Sampling stations (squares) in four areas of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

sand, *Halodule wrightii* is the predominant vegetation. Extensive beds of *Thalassia testudinum* occur in deeper water. Stations 1, 2, 7, 8, 9, and 12 are in this area (Fig. 1).

Area II (East Bay, West Bay, lower North Bay) is characterized by low salinity, sparse vegetation, and a soft sand-silt bottom. The nearshore zone is principally composed of mixed humus and sand, with *Juncus roemerianus* along the shore. Offshore, sparse beds of *H. wrightii* are successively replaced by *T. testudinum* as depth increases. Stations 3, 4, 5, 10, and 11 are in this area (Fig. 1).

Area III (upper North Bay) represents an interface between the brackish water of North Bay and the fresh water in Deer Point Lake. The bottom consists uniformly of firm sand with no vegetation. Only Station 6 is in this area (Fig. 1).

Area IV (beach along the Gulf of Mexico) is characterized by firm white sandy bottoms with no attached vegetation and clear water with high salinities. Stations 13-17 are located in this area (Fig. 1).

## MATERIALS AND METHODS

A nylon beach seine measuring 30.5 x 1.8 m with 0.64 cm<sup>2</sup> bar mesh netting was used for sampling. At each station the seine was set perpendicular to the shore, one end fixed onshore and the other end pulled in an arch back to shore. Two hauls were made at each station, each arc in an opposite direction. The area encircled by the two seine hauls was a half-circle with a radius of 23 m. For each station the sampled area covered 821 m<sup>2</sup>. Fish collections were made monthly from August 1974 through July 1975. All sampling was during daylight hours.

Immediately after sampling, specimens were placed in plastic bags, stored on ice and then frozen. Later, thawed specimens were identified to species, counted, measured, and weighed. Total lengths, to the nearest mm, of all fish were recorded for species containing less than 50 individuals. For species containing more than 50 individuals, 50 fish were randomly selected and measured. Total weight, to the nearest 0.1 g, for each species was recorded.

A water sample for salinity was taken at each station. Salinity was measured in the laboratory with a Goldberg (reference to trade name does not imply endorsement by the National Marine Fisheries Service, NOAA) refractometer. Water temperature was measured in the field with a mercury thermometer.

## RESULTS

**Temperature and Salinity:** Annual temperature and salinity patterns were similar between areas. Temperatures were as expected: high in summer, falling in autumn, low in winter, and rising in spring (Fig. 2). Water temperatures ranged from 8.7°C (December) to 33.9°C (July). Salinities ranged from 0.0‰ to 35.4‰ (Fig. 2). Station 6 (Area III), located below the dam of a freshwater lake, consistently had the lowest mean salinities, while Stations 13-17 (Area IV) had the highest mean salinities. During the study period, salinities at Station 13-17 fluctuated least, while salinities at Stations 3, 4, 5, 6, 10, and 11 (Areas II, III) fluctuated most.

**Total Catch:** A total of 99,579 fishes representing 88 species and 41 families was caught during the sampling period (Table 1). Of the total catch, 10,342

Table I. Abundance and distribution of fishes seined from the nearshore zone of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

Species	Area				Total	% of grand total	Mean length (cm)	Mean weight (g)
	I	II	III	IV				
<i>Menidia beryllina</i> *	19,624	7,216	856	559	28,255	28.4	5.3	2.3
<i>Lagodon rhomboides</i>	18,936	2,597	46	514	22,093	22.2	4.6	5.0
<i>Leiostomus xanthurus</i>	5,090	4,919	2	220	10,231	10.3	9.0	6.7
<i>Eucinostomus argenteus</i>	5,807	1,148	898	40	7,893	7.9	4.3	1.9
<i>Fundulus similis</i>	808	5,929	531	229	7,497	7.5	4.0	4.5
<i>Harengula jaguana</i>	14	0	0	6,343	6,357	6.4	3.7	0.8
<i>Lucania parva</i>	353	4,617	1	0	4,971	4.9	2.7	2.2
<i>Cyprinodon variegatus</i>	237	3,547	113	17	3,914	3.9	3.6	2.3
<i>Fundulus grandis</i>	176	1,863	95	76	2,210	2.2	5.2	6.7
<i>Mugil curema</i>	244	540	47	464	1,295	1.3	3.2	3.0
<i>Trachinotus carolinus</i>	14	2	0	493	509	0.5	7.0	13.2
<i>Microgobius gulosus</i>	17	465	10	0	492	0.5	3.5	0.7
<i>Mugil cephalus</i>	64	209	180	1	454	0.4	8.2	26.6
<i>Adinia xenica</i>	8	335	1	0	344	0.3	2.7	0.7
<i>Poecilia latipinna</i>	2	270	0	0	272	0.3	3.7	1.4
<i>Syngnathus scovelli</i>	80	186	0	0	266	0.2	11.7	0.8
<i>Strongylura marina</i>	115	67	37	41	260	0.2	17.4	15.3
<i>Menticirrhus littoralis</i>	2	0	0	257	259	0.2	3.8	5.5
<i>Cynoscion nebulosus</i>	31	161	0	0	192	0.2	5.7	3.8
<i>Orthopristis chrysoptera</i>	169	16	0	6	191	0.2	8.2	15.2
<i>Anchoa mitchilli</i>	0	143	0	0	143	0.1	6.3	2.3
<i>Anchoa lyolepis</i>	0	0	115	4	119	0.1	2.7	0.2
<i>Bairdiella chrysura</i>	30	89	0	0	119	0.1	6.2	8.1
<i>Strongylura notata</i>	56	27	11	12	106	0.1	12.6	14.0
<i>Paralichthys albigitata</i>	56	1	0	28	85	0.1	6.1	10.1
<i>Caranx hippos</i>	5	13	14	50	82	0.1	4.7	4.2
<i>Oligoplites saurus</i>	23	40	15	1	79	0.1	5.7	2.8
<i>Lutjanus griseus</i>	69	5	0	0	74	0.1	3.8	2.7
<i>Gobionellus shufeldti</i>	10	57	0	0	67	0.1	2.5	0.2
<i>Hyporhamphus unifasciatus</i>	13	0	0	54	67	0.1	14.3	11.8
<i>Achirus lineatus</i>	48	12	0	0	60	0.1	2.9	1.4
<i>Gobiosoma robustum</i>	8	52	0	0	60	0.1	2.6	0.3
<i>Symphurus plagiura</i>	45	11	1	1	58	0.1	5.2	4.6
<i>Eucinostomus gula</i>	38	0	0	12	50	0.1	6.7	10.2
<i>Menticirrhus focaliger</i>	2	0	0	34	36	<0.1	5.5	4.0
<i>Sphoeroides nephelus</i>	4	20	2	0	26	<0.1	6.0	12.2
<i>Trachinotus falcatus</i>	0	0	0	25	25	<0.1	2.2	0.7
<i>Elops saurus</i>	0	0	6	17	23	<0.1	20.2	118.8
<i>Hypsoblennius hentzi</i>	3	20	0	0	23	<0.1	3.5	1.3
<i>Menticirrhus americanus</i>	0	0	0	22	22	<0.1	5.6	6.7
<i>Syngnathus louisianae</i>	8	14	0	0	22	<0.1	10.5	1.1
<i>Nicholsina usta</i>	20	0	0	0	20	<0.1	6.5	9.7
<i>Monacanthus hispidus</i>	17	0	0	2	19	<0.1	2.5	1.0
<i>Opsanus beta</i>	2	17	0	0	19	<0.1	10.9	36.1
<i>Bathygobius soporator</i>	11	5	0	0	16	<0.1	4.8	2.5
<i>Synodus foetens</i>	2	8	0	6	16	<0.1	10.9	27.8
<i>Lepomis macrochirus</i>	0	1	14	0	15	<0.1	4.5	1.7
<i>Membras martinica</i>	0	0	0	14	14	<0.1	7.0	3.6
<i>Anchoa sp.</i>	0	0	0	13	13	<0.1	3.6	0.4
<i>Sphoeroides sp.</i>	5	8	0	0	13	<0.1	2.2	1.0
<i>Chilomycterus schoepfi</i>	8	3	0	1	12	<0.1	9.4	94.7
<i>Astroscopus y-graecum</i>	7	0	0	3	10	<0.1	4.9	7.2
<i>Gobiosoma bosci</i>	3	7	0	0	10	<0.1	2.9	0.9
<i>Chaetodipterus faber</i>	0	0	0	9	9	<0.1	2.6	1.3
<i>Syngnathus floridae</i>	5	3	0	0	8	<0.1	9.8	0.9
<i>Anchoa hepsetus</i>	0	0	0	7	7	<0.1	4.2	0.7
<i>Dasyatis sabina</i>	2	2	3	0	7	<0.1	28.1	499.2
<i>Lactophrys quadricornis</i>	4	3	0	0	7	<0.1	13.8	101.1

Table 1 - (cont.)

Species	Area				Total	% of grand total	Mean length (cm)	Mean weight (g)
	I	II	III	IV				
<i>Sphoeroides parvus</i>	4	3	0	0	7	<0.1	4.6	5.4
<i>Caranx bartholomaei</i>	1	0	2	2	5	<0.1	8.0	14.7
<i>Sphyræna barracuda</i>	5	0	0	0	5	<0.1	9.3	4.6
<i>Chloroscombrus chrysurus</i>	1	1	0	2	4	<0.1	1.6	0.1
<i>Hippocampus zosterae</i>	4	0	0	0	4	<0.1	2.9	0.2
<i>Chasmodes saburrae</i>	0	3	0	0	3	<0.1	4.8	3.0
<i>Citharichthys macrops</i>	1	0	0	2	3	<0.1	10.2	19.9
<i>Sphyræna borealis</i>	2	0	0	1	3	<0.1	8.2	4.1
<i>Strongylura</i> sp.	0	3	0	0	3	<0.1	4.4	0.1
<i>Chilomycterus antillarum</i>	1	1	0	0	2	<0.1	4.8	17.8
<i>Cynoscion arenarius</i>	0	0	0	2	2	<0.1	4.3	1.1
<i>Mycteroperca microlepis</i>	2	0	0	0	2	<0.1	5.6	40.1
<i>Prionotus scitulus</i>	0	1	0	1	2	<0.1	8.9	14.8
<i>Prionotus tribulus</i>								
<i>Prionotus tribulus</i>	0	2	0	0	2	<0.1	0.6	0.2
<i>Arius felis</i>	0	1	0	0	1	<0.1	22.1	175.0
<i>Dasyatis sayi</i>	0	0	0	1	1	<0.1	17.6	222.6
<i>Engraulis eurystole</i>	0	0	0	1	1	<0.1	6.6	2.4
<i>Hemipteronotus novacula</i>	1	0	0	0	1	<0.1	7.4	5.9
<i>Hippocampus erectus</i>	1	0	0	0	1	<0.1	8.7	4.7
<i>Lutjanus synagris</i>	1	0	0	0	1	<0.1	6.5	5.0
<i>Micrognathus crinigerus</i>	1	0	0	0	1	<0.1	8.3	0.4
<i>Micropterus salmoides</i>	0	0	1	0	1	<0.1	5.1	2.3
<i>Micropogon undulatus</i>	0	1	0	0	1	<0.1	10.6	25.8
<i>Monacanthus ciliatus</i>	1	0	0	0	1	<0.1	4.3	2.7
<i>Myrophis punctatus</i>	0	0	0	1	1	<0.1	5.5	0.1
<i>Notropis petersoni</i>	0	0	1	0	1	<0.1	4.8	1.0
<i>Polydactylus octonemus</i>	0	0	0	1	1	<0.1	19.0	76.1
<i>Rachycentron canadum</i>	0	0	0	1	1	<0.1	7.1	3.3
<i>Trinectes maculatus</i>	0	1	0	0	1	<0.1	7.6	9.0
<i>Tylosurus crocodilus</i>	1	0	0	0	1	<0.1	2.5	28.8
Total	53,322	34,665	3,002	9,590	99,579	99.9	---	381,350.5
Average per station	8,720	6,933	3,002	1,918	5,857	---	---	22,432
No. species per area	61	52	25	44	---	---	---	---

\*Fishes identified as *Menidia beryllina* may also be in part *M. peninsulae* (Johnson, Copeia 1975 (4):662-691).

were *Lagodon rhomboides* that were taken at Station 12 (Area I) in May. This single catch at one station represents 10.4% of the total catch for the entire survey.

**Fish Lengths:** Mean lengths for the majority of species were small with a few notable exceptions (Table 1). The percentage of species with an average length of less than 4 cm was 27.3%. The percentage for fishes of average lengths between 4 cm and 6 cm was 29.5% and the percentage for those between 6 cm

and 10 cm was 26.1%. The remaining 17.0% had average lengths of 11 cm or larger. The majority of species were represented by individuals who were juveniles or subadults (Table 1). This fact would indicate that the St. Andrew Bay and adjacent waters are important nursery grounds and as such should be afforded special consideration in terms of coastal zone management (Sykes and Finucane, 1966). The largest species was *Dasyatis sabina*, which averaged 28.1 cm. Other species with large mean lengths were *Arius felis*, 22.1 cm, and

*Elops saurus*, 20.2 cm (Table 1).

**Fish Weights:** Total wet weights by station and month varied considerably (Table 2). The combined total was 381.4 kg. The catch per month for all stations and for each area varied seasonally. The lowest percentage of catch-by-weight occurred in the winter months (20.0% for Dec., Jan., and Feb.). A gradual increase in catch-by-weight was evident from spring collections (20.2% for Mar., Apr., and May), through summer (27.2% for June, July, and Aug.) to autumn collections (32.5% for Sept., Oct., and Nov.). The large catch-by-weight reported for January (6 kg) was primarily due to the collection of over 2,500 *Leiostomus xanthurus* at Station 7 (Area I). This one large school of fish weighed 4.7 kg and comprised 78.3% of the total weight reported for January collections. Catch weight for each area by month is shown in Figure 3. The general seasonal trend in catch-by-weight for all stations (Table 2) is also apparent between areas (Fig. 3). Weight of catches tends to be high in autumn, low in winter, rising in spring and summer.

Mean weights for the majority of species were low (Table 1). Of the 88 species taken in this beach seine survey, 60.2% of the individuals in all the species averaged 5g or less; 11.3% aver-

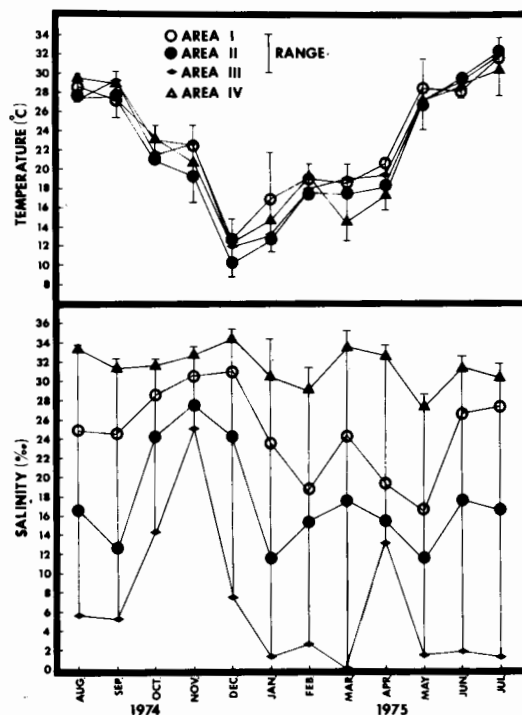


Figure 2. Monthly means and ranges of water temperatures ( $^{\circ}\text{C}$ ) and salinity ( $\text{‰}$ ) for each area of St. Andrew Bay, Florida, and adjacent coast, August 1974 through July 1975.

aged between 6 and 10g; 13.6% averaged between 11 and 20g. The remaining 14.8% averaged from 21 to 500g.

**Seasonality of Catch:** The number of fishes and species from St. Andrew Bay and adjacent coastal waters varied according to season. The winter months had the

Table 2. Weights (g) of fish catches by months and stations in the nearshore zone of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

Station (Area)	1974					1975							Total
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
1(I)	2,908.4	7,141.1	3,045.8	4,115.1	1,686.3	559.5	317.6	675.1	315.3	1,482.7	1,741.1	199.8	24,187.8
2(I)	5,947.3	2,859.4	803.3	773.3	64.9	345.1	1,217.6	532.3	533.9	1,416.2	1,406.0	575.5	16,474.8
3(II)	3,107.9	1,655.5	4,515.4	10,363.3	288.2	6,178.6	46.9	532.0	1,833.8	334.7	1,421.9	1,858.1	32,136.3
4(II)	863.1	759.7	5,648.6	2,984.8	225.6	1,450.4	659.8	722.3	1,596.0	1,950.5	545.8	491.4	15,898.0
5(II)	1,876.4	3,867.1	2,103.8	2,411.4	47.8	1,836.0	1,184.5	11,268.2	2,145.8	1,692.6	585.7	221.8	29,241.1
6(III)	1,904.4	6,607.3	1,209.4	2,079.5	642.7	71.6	731.5	337.0	1,087.0	1,707.5	949.7	68.1	17,395.7
7(I)	4,184.2	6,235.4	968.8	830.3	96.6	47,575.9	1,147.1	168.2	1,298.1	1,572.7	1,322.2	382.8	65,779.3
8(I)	2,869.5	7,439.2	3,443.5	1,494.3	493.5	848.5	82.1	764.6	1,518.5	2,904.6	3,005.5	3,710.7	28,574.5
9(I)	9,094.3	5,498.0	3,279.0	2,074.6	586.2	32.8	356.8	169.8	5,193.6	2,729.7	2,450.3	855.2	32,320.3
10(II)	860.3	2,058.5	443.3	1,746.9	413.7	36.7	1,717.6	2,842.9	515.1	1,571.3	421.7	1,623.6	14,251.6
11(II)	1,883.4	1,933.3	149.8	993.1	241.6	96.4	962.1	109.7	7,204.6	3,084.1	1,100.2	6,244.0	24,002.3
12(II)	8,818.2	10,802.6	3,724.0	1,880.4	180.3	746.0	1,288.3	136.6	3.3	12,469.3	2,484.9	1,453.9	43,987.8
13(IV)	3,264.5	1,158.9	1,653.7	2,322.7	3.8	218.2	763.9	647.4	393.6	1,046.7	3,973.3	1,288.1	16,734.8
14(IV)	535.4	2,221.0	19.3	15.0	302.3	22.9	374.2	14.1	4.2	1.8	129.6	2,041.9	5,771.7
15(IV)	1,419.4	610.0	3.1	15.0	26.8	0	23.8	6.4	0	0.5	0	3,267.5	5,372.5
16(IV)	358.9	0	88.4	32.0	11.8	4.4	2.2	2.8	8.1	18.8	1,405.2	2,326.6	4,259.2
17(IV)	1,509.5	75.9	10.4	12.6	0	38.8	0.5	0	3.5	495.7	1,976.6	839.3	4,962.8
Total	51,405.1	60,922.9	29,109.6	34,144.3	5,402.1	60,061.8	10,873.5	18,929.4	23,654.4	34,479.4	24,919.7	27,448.3	381,350.5

lowest percentage of the total catch (15.1%). There was a gradual increase in catch from spring collections (25.8%) through summer (29.1%) to autumn (30.9%). The highest catches of fish were made in August, September, May, and July; the lowest catches were made in December, February, April, and June (Table 3). The single large catch of *Lagodon rhomboides* at Station 12 (Area I) accounted for the high total catch in May (Fig. 4). Areas I and II had higher numbers of individuals in the majority of months. The large increase in numbers of individuals in Area IV for June and July was due to the occurrence of large numbers of *Harengula jaguana* along the gulf beach stations (Fig. 4). The number of species per month varied from 24 in April to 51 in August. The number of species per month was high between June and November and low from December through May (Table 3).

The number of species per station for each area varied seasonally (Fig. 5).

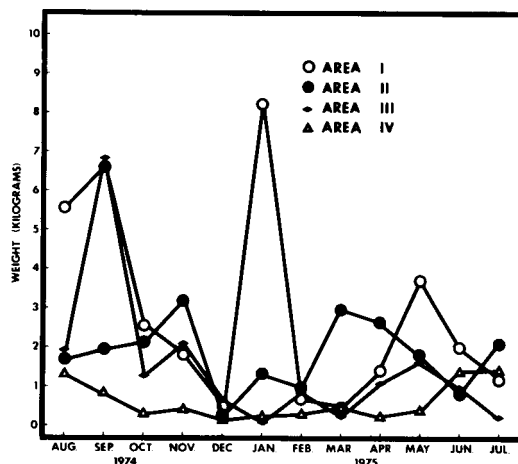


Figure 3. Monthly weight (kg) of fish collections from each area of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

Generally, numbers of species were at a seasonal low in the winter and increased steadily to a seasonal high in the summer and autumn. The differences in numbers of species between areas may be due to sampling bias. Collections in Area IV had lower numbers of species in the majority of months, a fact that may be due to the difficulty in sampling the high energy outer beach swash zone coupled with net avoidance due to lower turbidity.

### DISCUSSION AND SUMMARY BY AREA

The nearshore zone is different for each area of the St. Andrew Bay system. Area I is deeper, and has higher annual average salinities than any other area within the bay system. Areas II and III are different in character due to their lower annual average and greater annual range of temperatures and salinities. Waters in these areas are more turbid and shallower than Area I (Ichiye and

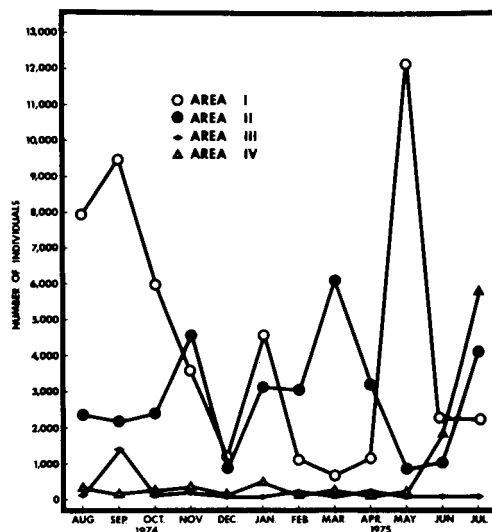


Figure 4. Number of individuals of fishes collected monthly from each area of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

Table 3. Numbers of fishes caught each month in the nearshore zone of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

Species	1974					1975						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul
<i>Menidia beryllina</i>	5,811	6,956	2,656	1,513	954	586	1,006	804	911	689	1,488	4,881
<i>Lagodon rhomboides</i>	2,352	2,342	1,031	618	3	115	461	1,072	1,201	11,534	992	372
<i>Leiostomus xanthurus</i>	142	130	2	2	232	3,930	1,937	2,030	1,181	355	181	109
<i>Eucinostomus argenteus</i>	1,107	2,378	2,282	1,678	0	6	0	0	12	225	70	135
<i>Fundulus similis</i>	362	426	1,078	2,171	447	1,472	282	254	513	122	311	59
<i>Harengula jaguana</i>	3	13	23	3	0	0	0	0	0	0	1,050	5,265
<i>Lucania parva</i>	172	337	381	200	28	85	58	2,938	14	63	201	494
<i>Cyprinodon variegatus</i>	160	25	403	1,422	445	827	106	33	405	28	57	3
<i>Fundulus grandis</i>	131	63	513	531	102	357	28	65	153	132	90	45
<i>Mugil curema</i>	14	56	10	10	4	591	519	55	0	2	3	31
<i>Trachinotus carolinus</i>	71	28	7	4	14	0	0	0	1	4	167	212
<i>Microgobius gulosus</i>	37	13	9	51	1	20	88	37	28	45	68	95
<i>Mugil cephalus</i>	59	94	11	40	0	1	3	46	170	20	2	8
<i>Adinia xenica</i>	20	0	27	103	6	16	1	0	163	3	5	0
<i>Poecilia latipinna</i>	67	12	2	189	2	0	0	0	0	0	0	0
<i>Syngnathus scovelli</i>	4	2	14	25	7	46	84	54	11	7	0	12
<i>Strongylura marina</i>	69	70	15	3	1	0	8	1	1	14	47	31
<i>Menticirrhus littoralis</i>	10	3	1	23	7	2	1	2	1	0	67	142
<i>Cynoscion nebulosus</i>	21	35	40	28	0	0	0	0	0	0	24	44
<i>Orthopristis chrysoptera</i>	86	67	10	2	0	0	0	0	0	5	9	12
<i>Anchoa mitchilli</i>	0	0	0	0	0	0	0	0	3	139	0	1
<i>Anchoa lyolepis</i>	2	115	1	0	0	0	0	0	0	0	1	0
<i>Bairdiella chrysura</i>	68	4	8	0	0	0	1	0	0	0	7	31
<i>Strongylura notata</i>	0	35	31	3	0	0	0	0	0	1	14	22
<i>Paralichthys albigutta</i>	3	0	1	0	0	9	11	16	24	11	7	3
<i>Caranx hippos</i>	4	0	0	14	0	0	0	0	0	1	10	53
<i>Oligoplites saurus</i>	15	30	3	0	0	0	0	0	0	0	0	31
<i>Lutjanus griseus</i>	8	28	32	3	0	0	0	0	1	0	2	0
<i>Gobionellus shufeldti</i>	1	0	18	13	2	3	4	22	0	0	0	4
<i>Hyporhamphus unifasciatus</i>	63	1	0	0	0	0	0	0	0	0	0	3
<i>Achirus lineatus</i>	17	22	10	6	0	0	0	1	0	0	1	3
<i>Gobiosoma robustum</i>	1	0	0	21	5	8	9	8	1	0	0	7
<i>Symphurus plagiusa</i>	1	14	6	4	0	0	2	1	7	15	6	2
<i>Eucinostomus gula</i>	34	0	0	5	0	0	0	0	0	0	10	1
<i>Menticirrhus focaliger</i>	0	0	0	2	26	1	0	1	2	4	0	0
<i>Sphoeroides nephelus</i>	5	10	3	1	1	0	1	1	0	1	2	1
<i>Trachinotus falcatus</i>	0	0	21	4	0	0	0	0	0	0	0	0
<i>Elops saurus</i>	5	17	0	0	0	0	0	0	0	0	1	0
<i>Hypsoblennius hentzi</i>	2	0	10	0	1	0	8	1	0	0	0	1
<i>Menticirrhus americanus</i>	10	1	7	3	0	0	0	0	0	0	0	1
<i>Syngnathus louisianae</i>	0	3	14	4	0	0	0	0	0	0	1	0
<i>Nicholsina usta</i>	2	9	8	0	0	1	0	0	0	0	0	0
<i>Monacanthus hispidus</i>	1	1	6	8	0	0	1	0	0	1	0	1
<i>Opsanus beta</i>	4	5	2	2	0	0	1	0	0	0	2	3
<i>Bathygobius soporator</i>	3	0	7	1	0	0	3	1	1	0	0	0
<i>Synodus foetens</i>	1	8	2	3	0	0	1	0	0	0	1	0
<i>Lepomis macrochirus</i>	10	0	0	0	1	1	3	0	0	0	0	0
<i>Membras martinica</i>	0	0	0	0	7	6	1	0	0	0	0	0
<i>Anchoa sp.</i>	0	0	0	0	0	1	0	0	0	0	0	12
<i>Sphoeroides sp.</i>	0	0	0	3	0	0	0	0	0	5	4	1
<i>Chilomycterus schoepfi</i>	1	2	0	2	0	0	1	0	0	0	4	2
<i>Astroscoptes y-graecum</i>	0	0	0	0	0	0	3	3	0	4	0	0
<i>Gobiosoma bosci</i>	0	0	0	0	0	0	3	4	0	1	0	2
<i>Chaetodipterus faber</i>	0	0	0	0	0	0	0	0	0	0	9	0
<i>Syngnathus floridae</i>	0	1	2	0	2	1	0	0	2	0	0	0
<i>Anchoa hepsetus</i>	0	0	0	0	0	0	0	0	0	0	0	7
<i>Dasyatis sabina</i>	1	0	0	2	1	0	0	0	0	1	2	0
<i>Lactophrys quadricornis</i>	2	2	0	0	0	0	0	0	0	3	0	0
<i>Sphoeroides parvus</i>	0	0	0	0	0	0	0	0	0	2	1	4
<i>Caranx bartholomaei</i>	0	3	2	0	0	0	0	0	0	0	0	0
<i>Sphyræna barracuda</i>	0	0	5	0	0	0	0	0	0	0	0	0
<i>Chloroscombrus chrysurus</i>	2	1	0	0	0	0	0	0	0	0	0	1
<i>Hippocampus zosterae</i>	0	1	0	0	0	1	0	0	1	0	1	0
<i>Chasmodes saburrae</i>	0	0	0	0	0	0	3	0	0	0	0	0
<i>Citharichthys macrops</i>	0	1	2	0	0	0	0	0	0	0	0	0
<i>Sphyræna borealis</i>	0	0	0	0	0	0	0	1	0	2	0	0
<i>Strongylura sp.</i>	0	0	0	0	0	0	0	0	0	3	0	0
<i>Chilomycterus antillarum</i>	1	1	0	0	0	0	0	0	0	0	0	0
<i>Cynoscion arenarius</i>	0	0	0	0	0	2	0	0	0	0	0	0
<i>Mycteroperca microlepis</i>	2	0	0	0	0	0	0	0	0	0	0	0
<i>Prionotus scitulus</i>	0	1	0	0	0	0	0	1	0	0	0	0



Table 3 - (cont.)

Species	1974					1975						
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul
<i>Prionotus tribulus</i>	0	0	0	2	0	0	0	0	0	0	0	0
<i>Arius felis</i>	0	0	0	0	0	0	0	0	0	1	0	0
<i>Dasyatis sayi</i>	1	0	0	0	0	0	0	0	0	0	0	0
<i>Engraulis eurystole</i>	0	0	0	0	0	1	0	0	0	0	0	0
<i>Hemipteronotus novacula</i>	0	1	0	0	0	0	0	0	0	0	0	0
<i>Hippocampus erectus</i>	0	0	0	1	0	0	0	0	0	0	0	0
<i>Lutjanus synagris</i>	0	1	0	0	0	0	0	0	0	0	0	0
<i>Micrognathus crinigerus</i>	0	0	0	0	1	0	0	0	0	0	0	0
<i>Micropterus salmoides</i>	1	0	0	0	0	0	0	0	0	0	0	0
<i>Micropogon undulatus</i>	0	0	0	0	0	0	0	0	0	0	1	0
<i>Monacanthus ciliatus</i>	0	0	0	0	1	0	0	0	0	0	0	0
<i>Myrophis punctatus</i>	0	0	0	0	0	1	0	0	0	0	0	0
<i>Notropis petersoni</i>	0	0	0	0	0	1	0	0	0	0	0	0
<i>Polydactylus octonemus</i>	1	0	0	0	0	0	0	0	0	0	0	0
<i>Rachycentron canadum</i>	0	0	0	0	0	0	0	0	0	0	1	0
<i>Trinectes maculatus</i>	0	1	0	0	0	0	0	0	0	0	0	0
<i>Tylosurus crocodilus</i>	0	1	0	0	0	0	0	0	0	0	0	0
Total	10,970	13,370	8,716	8,724	2,301	8,091	4,638	7,452	4,807	13,443	4,920	12,147
Number of species	51	48	43	42	26	28	31	26	24	33	40	42
% of total	11.0	13.4	8.8	8.8	2.3	8.0	4.7	7.5	4.8	13.5	4.9	12.2

Jones, 1961). Area IV has the highest annual average and narrowest annual range of salinities, an absence of submerged attached vegetation and relatively clear water. Each area has its own ichthyofaunal characteristics.

#### Area I - St. Andrew Bay

The central bay had the largest catch of individuals per area (52,322), catch of individuals per station per year (8,720), number of species per area (61), number of species per station per year (9.4) (Table 1), and weight of fish per station per year (35.2 kg) (Table 2). Area I had an average standing crop of 35.7 kg/ha. The catches from Area I were dominated by four species in the majority of beach seine landings (Table 4). These four species (*Menidia beryllina*, *Lagodon rhomboides*, *Eucinostomus argenteus*, and *Leiostomus xanthurus*) comprised 94.5% of the total catch from this area.

#### Area II - Upper Bays

East Bay, West Bay and the southern half of North Bay (Fig. 1) differed both physically and biologically from the central basin of St. Andrew Bay (Area I). Area II had a smaller catch of individuals per area (34,665), catch of individuals

per station per year (6,933), number of species per area (52), number of species per station per year (11.4) (Table 1), and weight of fish per station per year (23.1 kg) (Table 2). The standing crop was 23.4 kg/ha. Collections from the upper bay stations were dominated by an entirely different community of fishes. The cyprinodontids, peociliids, and atherinids were common in this region. *Menidia beryllina*, *Fundulus similis*, *Leiostomus xanthurus*, *Lucania parva*, and *Cyprinodon variegatus* comprised 75.7% of the total catch from this area (Table 4).

#### Area III - Deer Point Dam

The upper portion of North Bay represents an interface between the freshwater Deer Point Lake and North Bay (Fig. 1). This area had the least annual average and greatest annual range of salinities (Fig. 2). Area III had the lowest catch of individuals per area (3,002) and number of species per area (25) (Table 1). The standing crop (17.6 kg/ha), weight of fish per station per year (17.4 kg) (Table 2), and number of species per station per year (7.5) were the third highest of the four areas. Several specimens of freshwater species

(*Lepomis macrochirus*, *Micropterus salmoides*, and *Notropis petersoni*) were taken at Station 6 (Table 1). Some spill-over of the freshwater fauna from the lake into the brackish waters of North Bay (Area III) was obvious. Area III was dominated by three species - *Eucinostomus argenteus*, *Menidia beryllina*, and *Fundulus similis* (Table 4). These three species comprised 76.2% of all fishes landed at this site. Three of the freshwater species and the majority of marine

fishes taken by beach seine (Table 1) were previously reported by Crittenden (1957), who did a pre-impoundment study of North Bay using gill nets, rotenone, explosives, and an otter trawl. Area IV - Gulf Beach

This area was characterized by a high annual average and narrow annual range of salinities (Fig. 2). The catch of individuals per station per year (1,918), weight of fish per station per year (7.4 kg) (Table 2), standing crop (7.5 kg/ha),

Table 4. Ten most abundant fishes by area in the nearshore zone of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

Area I		Area II	
Species	% of total area catch	Species	% of total area catch
<i>Menidia beryllina</i>	37.5	<i>Menidia beryllina</i>	20.9
<i>Lagodon rhomboides</i>	36.2	<i>Fundulus similis</i>	17.1
<i>Eucinostomus argenteus</i>	11.1	<i>Leiostomus xanthurus</i>	14.2
<i>Leiostomus xanthurus</i>	9.7	<i>Lucania parva</i>	13.3
<i>Fundulus similis</i>	1.5	<i>Cyprinodon variegatus</i>	10.2
<i>Lucania parva</i>	0.7	<i>Lagodon rhomboides</i>	7.5
<i>Cyprinodon variegatus</i>	0.5	<i>Fundulus grandis</i>	5.4
<i>Mugil curema</i>	0.5	<i>Eucinostomus argenteus</i>	3.3
<i>Fundulus grandis</i>	0.3	<i>Mugil curema</i>	1.6
<i>Orthopristis chrysoptera</i>	0.3	<i>Microgobius gulosus</i>	1.3
Total	98.3	Total	94.8
Area III		Area IV	
Species	% of total area catch	Species	% of total area catch
<i>Eucinostomus argenteus</i>	29.7	<i>Harengula jaguana</i>	66.1
<i>Menidia beryllina</i>	28.3	<i>Menidia beryllina</i>	5.8
<i>Fundulus similis</i>	18.2	<i>Lagodon rhomboides</i>	5.4
<i>Mugil cephalus</i>	6.0	<i>Trachinotus carolinus</i>	5.1
<i>Anchoa lyolepis</i>	3.8	<i>Mugil curema</i>	4.8
<i>Cyprinodon variegatus</i>	3.7	<i>Menticirrhus littoralis</i>	2.7
<i>Fundulus grandis</i>	3.1	<i>Fundulus similis</i>	2.4
<i>Mugil curema</i>	1.6	<i>Leiostomus xanthurus</i>	2.3
<i>Lagodon rhomboides</i>	1.5	<i>Fundulus grandis</i>	0.8
<i>Strongylura marina</i>	1.2	<i>Hyporhamphus unifasciatus</i>	0.6
Total	97.1	Total	96.0

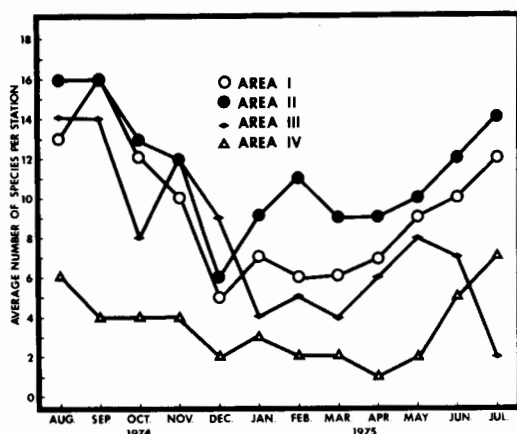


Figure 5. Number of species collected monthly from each area of St. Andrew Bay, Florida, and adjacent coast, 1974-1975.

and numbers of species per station per year (3.7) were the lowest recorded in all four areas. Collections from the gulf beach stations were dominated by only one species (*Harengula jaguana*) which comprised 66.1% of the total catch from Area IV (Table 4). Saloman (1974) studied the fishes of the nearshore zone along the gulf front beach at Sand Key, Florida. Of the ten most abundant species reported in his study, nine were also taken along Panama City Beach. Saloman also reported that of the total number of individuals, over half were *Harengula jaguana*.

Thus, each area within the St. Andrew Bay system and adjacent coastal waters has its own environmental and ichthyofaunal characteristics. Area II and III most represent estuarine conditions; they are dominated by five and three species, respectively, several of which (*Menidia beryllina*, *Fundulus similis*, *Cyprinodon variegatus*) spend their entire life cycle in estuaries. Area I is environmentally intermediate between Areas II and III and Area IV; it is dominated by four species, *Menidia beryllina*, *Lagodon*

*rhomboides*, *Eucinostomus argenteus*, and *Leiostomus xanthurus*, only one of which is entirely estuarine. Area IV is entirely marine (except after heavy rains); it is dominated by a coastal marine clupeid (*Harengula jaguana*).

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